NOAA Precision Navigation Workshop Executive Summary

Center for Coastal
and Ocean Mapping
/Joint Hydrographic Center
University of New Hampshire
August 13-14, 2019

Workshop Overview

NOAA is undertaking a cross-agency Precision Navigation project that brings together private-sector innovation and NOAA data streams to foster safer navigation in our nation's largest and busiest seaports. Precision navigation is about helping mariners make increasingly complex decisions as ever-larger ships make their way through congested U.S. ports while dealing with changing ocean and weather conditions. NOAA aims to involve its stakeholder communities from the very beginning in the planning and development of a dissemination system to provide easy access to NOAA's marine navigation datasets to ensure maximum benefit to users. It was in this spirit that NOAA held the *NOAA Precision Navigation Workshop* August 13-14th, 2019, at the University of New Hampshire's Center for Coastal and Ocean Mapping/Joint Hydrographic Center. The goals of the workshop were to:

Provide detailed information about Precision Navigation to industry users (PPU, ECDIS, UKC companies), so that they leave with a clear idea of what Precision Navigation is and where it is going.	Provide NOAA with a clear understanding of the technical requirements of participating companies and get feedback from the companies which ingest our data streams.	Strengthen NOAA and community relationships and lay the groundwork for further engagement and development over the years to come.

Workshop attendees included NOAA representatives across multiple Line Offices, other federal agencies, private industry, and academia. The workshop was structured such that the afternoon on August 13th was focused on providing attendees with a better understanding of Precision Navigation overall. August 14th was focused on providing additional detail into the development and future of Precision Navigation, and to breaking out into small groups to answer questions, provide feedback to NOAA, and engage in plenary discussion.

The workshop's presentations, panels, and discussions covered a wide range of topics including:

- A vision for the future of digital navigation
- The S100 product suite
- NOAA data provision
- Non-Real-Time Precision Navigation Products 9S-102 Gridded Bathymetry and S-57/S-101 High-Definition Charts)
- Real-Time Precision Navigation Products (S-111/S-104 Surface Currents/Water Levels and S-41X Marine Weather)
- Precision Navigation product dissemination
- Future NOAA-partner engagement

Precision Navigation

Overview

Precision Navigation will integrate marine navigation related datasets from different NOAA data streams into a single site where the datasets will be easily discoverable, accessible and machine readable. This will include NOAA datasets encoded into S-100 data formats. The datasets will be available to users including under keel clearance software companies, manufacturers of portable pilot units and electronic chart systems. By making all integrated data readily available, NOAA's partners in industry and academia will be able to develop new and improved products, tools, and services to deliver greater value to mariners. As the international community develops and approves additional S-100 formats, NOAA will encode additional marine-related data into these new S-100 formats.

Another component of Precision Navigation will be port specific projects. In order to provide assurances to vessels that they will not run aground, the Port of Long Beach pilot project was carried out. It involved the expansion of the physical observing infrastructure at the port, including forecasts for wave and swell conditions from the NWS, water level data from the NOS, wave buoy data from the U.S. Integrated Ocean Observing System, shoreline data from the NGS, and high resolution bathymetry from the NOS.

This was a collaborative effort across NOAA and with partners, and it is the aim of the Precision Navigation Program to bring this success to other key ports, beginning with New York/New Jersey, the Lower Mississippi.

Dissemination System

The system's single portal for integrated real-time observations and data will be based broadly on the successful implementation of NOAA's nowCOAST. It will also be cloud based to meet surges in demand from extreme weather, reduce overall maintenance costs, and more easily ingest data from other sources. A prototype of the dissemination system will be available on the loud in FY20. A more detailed schedule of projected program milestones may be found in *Attachment 1_Precision Navigation Overview* and *Attachment 6_NOAA Precision Navigation Dissemination System*.

Workshop Highlights

The following workshop highlights have been pulled from the full detailed accounting of results found in the report *NOAA Precision Navigation Workshop: Summary and Results (August 13-14, 2019).*

Integrating a Wide Range of Data Streams

NOAA currently provides a wide range of data streams including the real-time marine weather observations from a variety of platforms (buoys, C-MAN stations, PORTS stations/gages), marine weather forecasts, forecast guidance from oceanographic forecast models, ENCs and more. Given the broad range of data needs articulated by the collective breakout groups, there is great need and advantage in consolidating data within a single easily discoverable and accessible site.

Accounting for Differences in User Requirements

The Precision Navigation Dissemination System needs to keep in mind that different users have different requirements for data, information, bandwidth, resolution, and unique location-based requirements. Precision Navigation will need to provide solutions to each user profile and location (i.e. distance from shore) to ensure information is conveyed quickly and can be accessed easily with varying levels of bandwidth and resolution needs. It will also have to account for the dynamic needs of users, for example that marine weather forecasts and ocean model forecast guidance are most useful when planning, but point near-real-time observations become more important as ships come into port.

Incorporating and Understanding Uncertainty

Understanding data uncertainty and striving for data consistency is critically important to the success of Precision Navigation. Users need to understand how data decays over time, the inconsistencies between different products, scales, and data sources – all in a highly dynamic and ever-changing environment, necessitating quality metadata.

Obstacles and Challenges to Utilizing Real-Time Products

The greatest obstacles and challenges to the utilization of real-time products, in order of priority, are the reliability and quality of data and observation, user-friendly visual displays and formats, appropriate update frequencies, dependable technology infrastructure, good documentation, proper training and use of data, and appropriate cyber security considerations.

Real-Time Support and Communication

The Precision Navigation dissemination site needs to run 24x7. To ensure quality, reliability, and timely issue resolution, there needs to be an avenue for two-way communication. There also needs to be methods of reporting problems and receiving alerts on a tiered basis depending on issue severity.

Data Accessibility, Discoverability, and Documentation

Data must be easily accessible, discoverable, and well documented with code examples to facilitate ease of understanding and usability. Updates to existing data needs to be well documented, and the differences communicated clearly because "newer" is not always "better" depending on the requirements of the user.

Customizable Data Displays and Visualization

Critical to meeting diverse user needs is a customizable visualization. User visualization needs vary based on location and user profile, and users must be able to customize the data and displays that they see based on their bandwidth and resolution requirements. Displays also need to be simplified overall to eliminate onscreen clutter that can become distracting, deter use, or limit effectiveness.

Next Steps and Agreements

- The Precision Navigation Workshop will be held again on an annual basis.
- Future Precision Navigation engagement will involve broader engagement with federal partners outside of NOAA, and more industry partners (particularly pilots).
- NOAA will continue to send out updates and information as the Program progresses.
  NOAA seeks volunteers for testbeds and beta testers. Interested organizations should contact Captain Liz Kretovic (Elizabeth.Kretovic@noaa.gov) or John Kelley (John.Kelley@noaa.gov).